Zanzibar Protectorate.

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Agricultural Department

FOR THE YEAR

1932.

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Zanzibar Protectorate.

REPORT ON THE AGRICULTURAL DEPARTMENT

FOR THE YEAR 1932.

STAFF.

The sanctioned staff was maintained with the addition of a Silviculturist seconded from Tanganyika Territory for clove research work. The details are as under:—

Rank.	Name.	Period in Residence.
Director	A. J. Findlay, M.A., B.Sc. Agric. (Aber.), N.D.A., N.D.D.	January 28th to December 31st.
Assistant Director	Harold Waterland, Dip. Agric. (Harper Adams)	January 1st to February 29th, September 24th to December 31st.
Government Chemist	L. W. Raymond, B.A., B.Sc. Hons (London), A.R.C.S., A.I.C.	January 1st to September 8th.
Manager of Plantations	I. G. C. Squire	February 13th to December 31st.
Agricultural Officers	J. E. Baker, Cert. Agric. (Seale-Hayne)	January 1st to October 11th.
	J. R. P. Soper, B.A. (Cantab.)	Whole year
	J. V. R. Brown, B.Sc. Agric. (Edin.), F.S.I.	Whole year
	R. Johns, N.D.A., C.D.A. (Aberystwyth), A.I.C.T.A. (Trinidad)	Whole year
Inspector of Produce	T. M. W. Sheppard	January 1st to February 29th, September 8th to December 31st.
Silviculturist	L. G. T. Wigg, Dip. of Forestry (Distinction), B.A. in Forestry (Oxon.), B.A. in Honours School Natural Science (Botany) Oxon	October 21st to December 31st.

The Director, on transfer from Nigeria, assumed duty on January 28th, 1932.

As the Director is no longer also Government Chemist, Mr. Raymond's title was altered to that of Government Chemist.

The new Manager of Plantations, on transfer from Sierra Leone, assumed duty on February 13th.

Mr. Soper undertook the duties of the Inspector of Produce while Mr. Sheppard was on leave.

RE-ORGANIZATION.

In August 1931 Professor R. S. Troup, Director of the Imperial Forestry Institute, Oxford, visited the Protectorate to investigate the

question of clove cultivation and make recommendations. He submitted a valuable and comprehensive report which pointed out the unsatisfactory condition of many of the clove plantations and emphasised the necessity for improving the existing clove areas rather than planting up new areas, for reducing the cost of production and for the organization of research and experimental work on problems such as propagation, breeding, planting, cultivation, pruning, harvesting, etc.

In order to give effect to Professor Troup's recommendations, it was necessary to choose and establish experimental and demonstration stations in Zanzibar and Pemba. It was decided therefore to set aside certain of the Government plantations for this purpose; in Zanzibar, the Kizimbani estate was considered particularly suited for the purpose and is now being organized as the main experimental station for the Protectorate. In Pemba the choice was limited as there were no really good plantations with conditions properly suited for experimental and demonstration purposes, so it was decided to choose plantations which would be as nearly as possible representative of conditions in the northern, central and southern areas of the Island, and utilise the most suitable portions of them for our purposes. Thus initial experimental work is at present in progress at Matangatwani and Makondeni in the north, Wesha and Tundaua in the centre and Fufuni in the south.

The position with regard to the Government plantations and their utility or otherwise to the Department had also to be reviewed and a disposal scheme was approved the intent of which is to dispose of certain plantations not suitable, retaining those which can be used as demonstration areas and others which it is undesirable to dispose of for specific reasons. The Selem and Machui groups of Zanzibar plantations, each of which constitutes a separate extensive estate, are to be the main demonstration areas, on which practice proved by experiment on the experimental stations can be put into operation on a commercial scale. The stations in Pemba which have been reserved for experimental work will also serve as demonstration areas as there are no other Government plantations in Pemba which are of any use to the Department. Four of the odd plantations have already been disposed of and an effort is being made to find purchasers for the remainder, but they are so poor that they are not attractive to purchasers of plantation property.

Up to the end of March 1932, the Official Broker disposed of 10 properties valued at Rs. 66,840; after that date the Department itself effected sales of nine more properties valued at Rs. 1,01,250; the totals for the year are 19 properties; value Rs. 1,68,090. The prices realised are considered satisfactory for a time when valuations have depreciated very much owing to the low prices of cloves and copra. It is not anticipated that valuations of agricultural properties will appreciate for a very long time to come.

As the last season clove crop was a small one and the harvest of short duration—August to November—it was possible for the Agricul-

tural Officers to devote more time to agricultural work and participate fully in the work of re-organization and opening up of experiment stations, which they did most whole heartedly as a welcome change from issuing storage advances and collecting debts on cloves handled by the Clove Growers' Association. Fortunately the control of that body has now been placed on an independent basis so that it is now possible to put into effect Professor Troup's very pertinent recommendation that "Agricultural Officers should be given more time for experimental work directed towards the improvement and development of agriculture, without which they cannot be expected to give useful advice".

THE CLOVE INDUSTRY.

Production.—As the clove crop year is regarded as lasting from July to June, and the last crop reviewed was that of 1930-31, it is now necessary to go back beyond the actual period of this annual report and review the 1931-32 clove crop, the bulk of which was of course gathered in the latter half of 1931. This crop exceeded expectations, for although the previous crop was a small one, it had succeeded a record crop and another really big crop was not to be expected as large and small crops do not generally alternate in Zanzibar clove production. Previously there had appeared to be a sort of cycle in clove production in which a bumper crop was followed by a small crop and that by one or more medium or average crops. Thus the production figures for three seasons were:—

	Frasilas.*
1929-30	... 10,00,000
1930-31	... 3,00,000
1931-32	... 9,00,000

instead of as would have been anticipated:—

	Frasilas.
1929-30	... 10,00,000
1930-31	... 1,75,000
1931-32	... 6,50,000

Therefore the problem of the variations in the clove crop is still no nearer to being solved.

It may be said that for 1931-32 there was a nine lakh crop. It is quite impossible under existing conditions to give exact production figures for Zanzibar and Pemba because during any one season an indefinite proportion of that season's crop may be held up for delivery during next season or even later. We can estimate the standing crop and endeavour to verify that estimate by deliveries of cloves to Zanzibar Town, but the figure for the latter is not by any means a reliable estimate of the season's crop because it does not allow for hold-over and parcels brought to Town but not declared. The only reliable figure we can obtain is that for annual export, but that is no guide to annual production for it may represent only a portion of one season's big crop or portions of the produce of two or more seasons because cloves are often stored for prolonged periods. The export figures are of use therefore only as a guide to the trend of the clove trade.

*One frasila = 35 lbs.

Thus for 1931-32 the relative figures are:—

	Frasilas.
Estimated crop ...	9,00,000
Arrivals in Town ...	9,43,824
Exports August 1931 to July 1932 ...	6,96,736

Dividing the figure for arrivals, Pemba contributed 7,51,956 frasilas and Zanzibar 1,91,868 frasilas.

As it happened, the 1932-33 crop season was a short one and practically all the crop was harvested by the end of 1932; it is possible therefore to review the 1932-33 season crop in this report. The total crop was estimated at three lakhs, naturally a small crop after the previous large one, and it can be maintained with a very fair degree of accuracy that the estimate was reached. The arrivals in town for the period 1st August to 31st December, 1932, which can be taken as coinciding with the crop season, were 1,37,988 frasilas from Pemba and 2,02,040 frasilas from Zanzibar, a total of 3,40,028 frasilas. The Pemba arrivals included a considerable proportion of the 1931-32 crop; it is safe to say that the 1932-33 Pemba crop amounted to about three quarters of a lakh (75,000 frasilas) and the Zanzibar crop to about two and a quarter lakhs (2,25,000 frasilas). The Zanzibar "arrivals" figure represents less than the season's crop as part of it has been held over on account of low prices. This is borne out by the fact that the Clove Growers' Association still holds 25,419 frasilas of the 1932-33 crop and that Association handles less than 10% of the total crop.

Table No. I gives crop figures for the past 35 years.

The clove harvest in 1932 started late, generally about mid August; it reached its peak in mid October and was practically finished by the end of November, except in a few isolated places in Pemba when the *mvuli* crop was still being picked in small quantities at the end of the year. In Zanzibar the weather during the height of the harvest was most unfavourable and growers experienced great difficulty in drying their cloves, the quality of which suffered very much in consequence. In Pemba climatic conditions were more favourable, and it was only after the main harvest had finished at the end of November that drying difficulties were experienced. In Zanzibar there was a wide variation in production; some plantations yielded as much as $14\frac{3}{4}$ lbs. of dry cloves per tree, while others dropped to less than 1 lb.; the average over all may be taken at about 3 lbs. per tree, as compared with a general average over a long period of years of 5 lbs. per tree.

In Pemba production was confined almost entirely to the younger trees; the great majority of the old trees bore no cloves at all. The reason for this peculiar condition is meantime unexplainable, but the investigations which have now been instituted may throw some light on this perplexing problem.

At the height of the harvest in Zanzibar when drying grounds on the Government Plantations were badly congested, an attempt was made to relieve the situation by artificial drying, using the copra

kilns for this purpose. The quantities that could be dried on the limited drying surface of the kilns were comparatively small as it is necessary to spread the cloves in thin layers to obtain efficient drying; also it was found necessary to regulate very carefully the drying temperatures as a high temperature in the initial stages caused a loss in oil. Kiln-dried cloves turned out a light brown colour, rather too light to suit the general market tastes, but the great disadvantage appeared to be that on storing for a comparatively short time some of the samples of cloves turned practically black, which depreciated their market value. The question of artificial drying requires further investigation, but the present position would appear to be that the natural method of sun drying under normal conditions may be relied on to turn out the best quality cloves.

During 1931 there was a steady decline in the "duty paid" price of cloves from Rs. 19.33 and Rs. 18.45 in January to Rs. 13.93 and Rs. 12.41 in December for Zanzibar and Pemba respectively. The decline continued during 1932 when prices fell from Rs. 12.31 and Rs. 11.69 in January to Rs. 9.94 and Rs. 9.43 in December for Zanzibar and Pemba respectively. Table No. II in the Appendix gives comparative details of the prices of cloves and stems and the duty on cloves for 1931 and 1932.

The details of exports are given under the heading "Inspection of Produce".

THE COCONUT AND COPRA INDUSTRY.

The year 1932 showed a slight improvement as compared with 1931 in that the average price per frasila of copra for the year was Rs. 2.15 as compared with Rs. 1.91. Table III in the Appendix gives comparative details of price for 1931 and 1932.

The figure for domestic exports for 1932 is given as 2,36,000 cwts. as compared with 2,35,000 cwts. for 1931. It is not possible to calculate exactly the total production of copra in the Protectorate as a variable quantity is used by the oil mills, mostly for the production of oil for soap making and this is further complicated by the admixture of copra from the Mainland. The figure representing "domestic exports" may be taken as representing the difference between total exports and total imports, the latter amounting to 97,000 cwts. The imported copra is for the most part bulked with the locally produced copra in order to improve the quality as the former is slightly superior. The great bulk of Zanzibar copra is exported to the Southern European markets, viz. Marseilles and Genoa. Export figures for "domestic exports" show that 1,14,560 cwts. went to France and 1,19,526 cwts. to Italy. Only 1,385 cwts. went to Great Britain.

There is also an export of whole coconuts which amounted to 8,76,000 nuts in 1932.

The value of the domestic exports of copra for 1932 is given as Rs. 19,13,000 and that of whole nuts as Rs. 29,000.

There was no change in the quality of copra produced, which is mostly fire-dried of an inferior quality with a high moisture content and a big percentage of "meat" from immature nuts; there is therefore an excess of "mouldy" copra. Good sun-dried or kiln-dried copra always fetches a small premium in the local market but even the better qualities will not command prices representing their real values until the general level of quality is improved, and the Northern European markets will not be open to Zanzibar copra until that is achieved. Weather conditions in the Protectorate are generally too uncertain for extensive sun-drying, and besides the process is too lengthy for the liking of the copra makers, who prefer to smoke-dry for about two days only and put on the market immediately irrespective of the price they can realise. Under present conditions, copra production is definitely unprofitable; if greater care were exercised in preparation, and the general level of quality improved, with consequent improved prices, and production cost reduced to a minimum, copra producers might make ends meet even in a period of low prices.

As regards nut production, the year under review may be regarded as a normal one with climatic conditions generally favourable.

THE CLOVE GROWERS' ASSOCIATION.

The operations of the Association were continued but on a smaller scale than usual owing to the poor clove crop in 1932. Only 195 clove growers deposited consignments amounting to 11,057 bags weighing 34,778 frasilas, and Rs. 1,67,425.50 were advanced against cloves deposited at the rate of from Rs. 3 to Rs. 5 per frasila.

Only six Harvesting Loans were taken amounting to Rs. 735.

The position and constitution of the Clove Growers' Association came under discussion early in the year and was reviewed by Sir Alan Pim during the course of his financial enquiry. It has been realised for some time that it is not the proper function of an Agricultural Department to operate a scheme which is purely financial and that the work entailed had occupied an undue proportion of the time of the Agricultural Officers and consequently hindered and restricted real agricultural work.

It was decided that the Clove Growers' Association should be reconstituted in 1933 and placed on an independent basis under a business man who would be Secretary-Manager.

PRODUCE INSPECTION.

The Produce Inspection Branch of the Department deals only with the inspection of cloves immediately prior to export and is staffed by an European Inspector of Produce, three Examiners, and an Office Clerk; nine labourers are employed as samplers and are capable of dealing with a normal output.

The new Inspection Shed on the Customs wharf was opened on 1st October and just prior to this the Inspector of Produce was provided with more convenient office accommodation at Malindi. This

provision allowed of the installation of the "Brown Duvel Moisture Tester" and the consequent transfer from the Government Laboratory of all testing work connected with inspection, an arrangement which has expedited inspection and added to efficiency.

During the year under review 2,867 consignments consisting of 1,13,781 bales were presented for inspection and of these 83 consignments consisting of 3,282 bales failed to pass for export. The percentage of failures was 3% of consignments and 3% of bales as compared with 2.5% and 1.9% respectively for 1931. The higher figures for 1932 are accounted for by the fact that climatic conditions were unfavourable at the height of the 1932 harvest and hindered the efficient drying of cloves. The following table gives the monthly details of inspection:—

Month.	Presented for inspection.		Passed.		Failed.	
	Bales.	Consignments.	Bales.	Consignments.	Bales.	Consignments.
January	13,500	239	13,275	236	225	3
February	28,092	508	27,962	506	130	2
March	1,706	55	1,551	51	155	4
April	2,606	90	2,401	85	205	5
May	2,743	94	2,723	93	20	1
June	4,648	109	4,648	109	—	—
July	6,822	205	6,412	193	410	12
August	9,801	268	9,585	262	216	6
September	11,686	359	11,212	349	474	10
October	11,433	338	10,952	324	481	14
November	11,504	353	10,763	332	741	21
December	9,240	249	9,015	244	225	5
Totals	1,13,781	2,867	1,10,499	2,784	3,282	83

From the table it will be seen that the peak month was February when 27,962 bales were passed for export, chiefly to the Dutch East Indies. January also showed a heavy export. The fact that the export duty during these two months was only Rs. 1.80 per frasila and rose to Rs. 3.00 in March accounts for the heavy shipments. Average prices at that time were Rs. 10.77 for Zanzibar and Rs. 10.38 for Pemba cloves; the latter were in demand for export to the Dutch East Indies; hence the comparatively high price.

During the period—March-June—of high duty—Rs. 3.00—shipments were poor, only 11,703 bales. When the duty was dropped to Rs. 2.75, exports increased to an average of about 10,000 bales per month.

Average prices ex duty were:—

March-June	Rs. 9.00 to Rs. 10.00
July-August	Rs. 8.00 to Rs. 9.00
September-October	Rs. 7.00 to Rs. 8.00
November-December	Rs. 6.00 to Rs. 7.00

There was a steady decline during the month of December.

The quality of cloves exported was up to a fair average quality standard. The range of qualities of 2,784 consignments passed for shipment was:—

	Consignments.
A or Bombay Quality	1,340
B or F.M.Q. or Europe and U.S.A. Quality	1,002
C or Dutch East Indies Quality	442
Total	2,784

The following table gives details of destinations of exports for 1931 and 1932:—

	1931. Frasilas.	1932. Frasilas.
Dutch East Indies	2,90,755	1,29,350
India	1,92,160	1,99,584
United States of America	92,979	78,598
Great Britain	36,416	44,973
Continent of Europe	33,091	36,406
Straits Settlements	9,542	8,451
Africa	7,891	7,239
Japan	7,405	1,674
New Zealand and Australia	5,875	2,301
Canada	4,835	2,173
Asia	3,806	4,864
China	2,275	1,325
South America	861	1,635

It was estimated that at the end of the year there were approximately 4½ lakhs of cloves in Zanzibar Town and 1½ lakhs outside making a total carry-over of about six lakhs.

During the year 733 clove samples were examined as follows:—

Moisture only	... 136
Moisture and foreign matter	... 287
Foreign matter only	... 310
Total	... 733

In the moisture examinations 11% of the samples were found to contain moisture in excess of 16%, and in the case of foreign matter 11.6% were in excess of the allowance—5%—under the Inspection Decree. The highest moisture content registered was 20.4% and the highest foreign matter 8.91%.

Clove Stems.—January and February showed a steady export which dropped from March to August, and returned to an average of 10,000 frasilas a month from September to December. The heaviest shipment was in January—23,584 frasilas and the total export was 1,25,578 frasilas of which 63,190 went to Germany.

Average prices dropped from Rs. 1.77 in January to Rs. 1.06 in December, with the price at 78 cents on 31st December.

The following table gives the comparative destinations for 1931 and 1932:—

	1931. Cwts.	1932. Cwts.
Great Britain	24,501	15,419
India	719	747
Straits Settlements	1,217	893
South Africa	—	33
Canada	88	25
Dutch East Indies	2,614	1,789
Italy	250	313
China	—	53
Japan	505	187
Germany	20,109	19,747
Egypt	—	4
France	—	32
Ceylon	13	—
Aden	39	—
Holland	983	—
North America	313	—
Italian Somaliland	6	—
Portuguese East Africa	3	—
Tanganyika Territory	—	1
Totals	51,360 Fras. (1,64,352)	39,243 Fras. (1,25,578)

China took 828 frasilas of "mother of cloves", out of a total of 928 frasilas exported during 1932.

GOVERMNENT PLANTATIONS.

When the new Manager of Plantations arrived in the Protectorate on February 13th, a commencement was made with the re-organization of the working of the Government Plantations with the object of separating them from the ordinary work of the Agricultural Department and operating them on as nearly as possible a commercial basis with a proper system of costing and accounting so that the true financial position of all the properties might be revealed.

The process of separation and re-organization took some time to achieve and was complicated by the transfer of certain estates to the Department proper for experimental purposes and also by the sale of properties which by reason of their isolation were difficult to control efficiently and profitably and were of no value to the Department from the point of view of agricultural development.

The general policy adopted was to concentrate on certain groups of properties which could be efficiently and profitably operated and would serve as examples of clove and coconut estates worked on a commercial basis on improved methods which would be put into practice after they had been tried and proved on the experiment stations.

Owing to the depressed state of the plantation property market and the lack of local capital for investment there is still a number of properties unsold, although they have been offered for sale at very favourable prices based on a valuation which is at a low rate owing to the much depreciated value of plantation produce. The Manager of Plantations, therefore, has still under his control numerous scattered properties which are difficult of efficient supervision, are of doubtful economic value as small isolated units in a large plantations proposition, and detract from the strictly economic working of the larger and more important estates which require the close personal supervision of an European Manager.

Owing to the low prices realisable for plantation produce—cloves and copra—it was necessary to curtail expenditure to the minimum and carry out only strictly maintenance work. Thus there was effected a saving of Rs. 72,122.47 on the estimated expenditure for Government Plantations for 1932. If we exclude the item—Survey of Government Plantations—which should be regarded as a capital charge—Rs. 8,500 estimated and Rs. 8,143.50 spent—the financial position of the Government Plantations may be summarised thus:—

Revenue.		Rs.	Cts.
Coconuts	...	1,34,144	17
Cloves	...	65,130	07
Miscellaneous	...	2,660	99
Total	...	2,01,935	23
Estimated revenue	...	1,81,000	00
Excess over estimate	...	20,935	23

Expenditure.

		Rs.	Cts.
Headquarter charges	..	15,583	51
Field Staff	...	30,033	34
Labour	...	1,23,129	85
Other Charges	...	22,620	83
Total	...	1,91,367	53
Estimated expenditure (excluding Surveys)	...	2,63,490	00
Actual expenditure	...	1,91,367	53
Balance	...	72,122	47
Revenue	...	2,01,935	23
Expenditure	...	1,91,367	53
Excess of Revenue over Expenditure	...	10,567	70

The last figure should be adjusted by the addition of Rs. 1,195.00, charges against Meya's estates and of Rs. 2,958.43, representing the value of produce unsold at the end of the year. Thus the final figure for excess should read—Rs. 14,721.12.

Owing to the failure of the Pemba clove crop, the Pemba Group showed a nett loss of Rs. 16,693.58, the actual revenue amounting to only Rs. 6,857.59 together with Rs. 118.00 being the value of carry-over of cloves unsold.

It cannot yet be said that the figures given represent the true position with regard to Government plantations, because that was complicated by the sale of certain properties and the transfer of others to experimental work during the year. If produce prices had been normal and the revenue been in the region of the average for the previous five years, viz. Rs. 3,40,000, the position would have been very different, but with a reduced estimated expenditure for 1933 viz. Rs. 1,74,177, the position should improve provided that produce prices do not slump further. Yet the position as regards the Government Plantations may be taken as indicative of the present state of the clove and coconut industries in the Protectorate in that the margin of profit on working is not nearly sufficient to meet interest on capital.

Crops.

Cloves.—The clove crop from Government Plantations in Zanzibar for the 1932-33 season actually finished before the end of 1932 and amounted to 9,523 frasilas, which is about 850 frasilas below the average for the past twenty years. There was a great deal of variation in production on individual plantations; for example, Mgongowangamia yielded an average of 14.7 lbs. of dry cloves per tree as compared with 5.78 lbs. for the Kizimbani Group, 2.18 lbs. for the Selem Group and 1.62 lbs. for the Machui Group. With the failure of the Pemba crop, there was ample labour available in Zanzibar with the result that the percentage of the crop picked was probably higher than it might otherwise have been.

The clove harvest was late in starting—August; at first weather conditions were favourable and first quality cloves were produced, but after 9th September conditions changed and an excess of rain

and dull weather made drying operations difficult and prolonged; in some cases a period of four weeks was necessary to complete drying and green cloves had to be brought to Zanzibar Town for drying, where curiously enough weather conditions were favourable. Considering that harvesting conditions were so unfavourable, it is surprising that the quality of cloves did not suffer even more, for only a few consignments were of really poor quality. Copra kilns were utilised for drying in order to try and relieve congestion, but the resulting product was not very satisfactory as the cloves are too light in colour just after drying and tend to blacken on keeping.

The average loss of weight in drying was about normal at 69.7%.

The market price for best quality cloves dropped from Rs. 9 per frasila at the beginning of the harvest to Rs. 7 at the end of the year; the variation in prices for Government Plantations cloves was from Rs. 9.03 to Rs. 6.40 per frasila.

Great difficulty was experienced in drying clove stems which had often to be heaped in their green state; the quality was therefore poor.

The clove crop from the Pemba Plantations was an almost complete failure, amounting to only 236 frasilas. Picking commenced in July and lasted until November; a very small *mvuli* crop was being picked at the end of the year. The picking price was practically stable at about five pice per pishi. The crops on small shambas were leased for Rs. 366 as compared with Rs. 2,085 for 1931.

Coconuts and Copra, Zanzibar.—The coconut crop was more or less normal and 43,232 frasilas of copra were produced for sale at prices varying from Rs. 2 to Rs. 2.94 per frasila. In addition 2,00,000 selected nuts were sold to Italian Somaliland for seed purposes at prices varying from Rs. 25 to Rs. 23 per thousand, and 7,77,020 nuts were sold ex heap at prices varying from Rs. 22 in February, Rs. 15 in June, and Rs. 20 in October to Rs. 18 in December. The total revenue derived from coconuts and copra was Rs. 1,34,144.17.

It is calculated that the average number of nuts per bearing tree worked out at 30.9. This figure is not strictly correct as in the existing tree count the term "bearing tree" is used for all apparently mature trees whether they are bearing or not. A strict tree count of actual bearing trees would give a higher figure which would be further increased if the average loss by theft of fallen nuts could be calculated.

For all plantations the average number of frasilas of copra produced from 1,000 nuts worked out at 10.73; that is to say it required 5,965 nuts to produce one ton of copra.

Gatherings were made quarterly and nuts were allowed to mature in the heap for from four to 12 weeks before being husked and broken for kiln-drying. Very little sun-drying could be done owing to the uncertainty of the weather, although the sun-drying method definitely

produces the best copra, provided of course that it is never wetted by rain at any time during the drying process.

Government Plantations copra is always superior to ordinary Zanzibar and is always in demand by the local oil mills for oil and soap production purposes. In spite of the premium for good quality, it is doubtful if copra-making on the plantations is often a profit-earning undertaking at present prices.

Coconuts and Copra, Pemba.—The coconut crops were leased quarterly when possible, but difficulty was experienced in obtaining offers. Copra was produced only at Tundaua to the amount of 450 frasilas; in all other cases the nuts were sold. The crop was below average in quantity and quality.

Nurseries.—About 25,000 clove seedlings were supplied free of charge to local growers. Distribution nurseries on the Government Plantations have not been re-established as experiment stations have now commenced rearing selected seedlings for distribution.

EXPERIMENTAL WORK, ZANZIBAR.

The re-organization of the work of the Department included the selection of a Government Plantation which could be utilised as the main station of the Protectorate for investigational and experimental work. The Kizimbani estate was considered eminently suitable for this purpose and in May a commencement was made with the conversion of parts of this estate to experimental purposes. Initial work consisted in the provision of suitable roads, buildings for native staff and an adequate water supply for a nursery site of five acres for the rearing of selected clove seedlings and other economic trees and plants. Provision had also to be made for the housing of a permanent labour staff in properly constructed labour lines. All buildings were constructed with local materials, even the timber for doors and windows being cut and prepared on the estate. An area of about 15 acres of old clove land was felled and cleared to provide a suitable block for annual crop experiments, designed with a view to improvement in the production of local food crops.

An extensive experimental programme was drawn up and at the end of the year blocks of cloves and coconuts were being demarcated and prepared for the initiation of various experimental trials.

An essential part of the programme is the introduction and use of green manures and cover crops, principally for the increase and maintenance of soil fertility, for control of weed growth and reduction in cultivation costs. Thus one of the very first items in the experimental work was the introduction of seed from Ceylon and the Mainland and the laying down of qualitative and acclimatisation trials of probably suitable green manures and cover crops. Calopogonium mucunoides has proved to be the best long season ground cover and is likely to be used extensively with great advantage. Centrosema pubescens is of slower growth and less effective in weed control. Mucuna atropurpurea promises very well as a short season cover and

should be most useful in annual food crop cultivation. Of the erect types, Crotalaria striata and Tephrosia candida give most promise.

Poultry.—Two pens, each of nine hens and one cockerel, of the Rhode Island Red breed were imported from Kenya in October, the object being to commence poultry rearing for the improvement of local poultry stock. The egg-laying records were poor at first, and demands for eggs for hatching purposes could not be fully met, but a gradual improvement was noticeable at the end of the year and satisfactory results are anticipated.

In addition, ordinary estate work, including the harvesting of the clove crop, was carried out by the Agricultural Officer in charge of the station.

Minor Experiments.

Kinaoni.—The South African varieties of oranges and grape fruit bore a very small crop, but setting for the 1933 crop was much more promising. Black ants, stem borers and purple scale had to be dealt with as pests. Budding was not carried out on a large scale as the respective merits of the different varieties had not become apparent, but over 100 budded plants will be available for planting out in 1933. Results on rough lemon stocks are so far satisfactory.

Part of the Robusta coffee plots were abandoned as useless and the remainder—about 4½ acres—was split up into two portions to try the effect of shading with Glyricidia maculata, grown from large cuttings. The trees in the shaded portion improved in condition but did not bear so well as those in the unshaded portion; which however wilted more readily in the August drought. It seems that the presence of shade will eventually—probably quite early—prove beneficial.

The plot of Hydnocarpus anthelmintica made good progress and bore first fruit—one. Taractogenos Kurzii and Aleurites Fordii are making but slow progress.

Dunga.—The citrus plot with South African varieties of oranges and grape fruit yielded its second crop. Of the oranges, Valencia and Pineapple bore well, but the quality of the fruit as far as sugar: acid ratio is concerned is decidedly inferior to that of the average local orange. The Joppa variety does not appear to thrive at Dunga. The grape fruit, although up to the South African standards of juice content, were rather deficient in flavour. The skin also was thick and badly coloured. It is probable that there will be an improvement with the approach of maturity, so that conclusions at the present time would be premature. Purple scale and mealy bug were present to a small extent. The plot was cultivated and put down to Calopogonium and Centrosema cover crops in June, with satisfactory results.

Nineteen replicated plots of roughly half an acre each were laid out in the area of old clove trees near the main road, the object being to observe the effects of various methods of tending and cultivation on stands of cloves in poor condition. Obvious results, if any, cannot be expected for some time to come.

EXPERIMENTAL WORK, PEMBA.

As it was not until August 1932 that a decision could be reached with regard to the choice of plantations for experimental purposes in Pemba, only initial work in preparation for the experimental programme could be carried out for the remainder of the year. Cover crops for trial and seed purposes were raised and nurseries established at all stations. Experimental blocks for cloves, coconuts and annual food crops were demarcated and clearing was commenced. Buildings and roads were repaired and reconditioned in preparation for increased activities in 1933.

Climatic Conditions.—Table IV gives the details of meteorological observations for Zanzibar and Pemba for 1932. In Zanzibar the rainfall was a little above average, while in Pemba it was definitely below. The distribution was more or less normal, except for December which had a high rainfall.

CLOVE INVESTIGATIONAL WORK.

A Silviculturist, seconded from the Tanganyika Forest Department, arrived in October 1932 to take up the investigational work so strongly recommended by Professor Troup.

Most of the remainder of the year was spent in studying local conditions in the clove plantations, and the systematic collection and filing of available information on clove cultivation, but field work was commenced by the selection of fifty-one clove trees with desirable characters for use as seed trees. The first lots of seed from the selected trees were sown in the Kizimbani nursery before the end of the year and this provided material for starting investigations in nursery practice. A comparative trial of seed sown whole and hulled gave a complete superiority for the latter practice, resulting in more rapid and even germination, with a germination percentage of 80 as against 16. Another advantage of hulling is that a final selection can be made in the naked seed.

A small initial trial was made with shoot cuttings prepared from four year old saplings and planted out during the *mvuli* rains. These were not promising well at the end of the year and further trials with root and shoot cuttings will be made.

An investigation into the disposition and spread of the root systems of clove trees of different heights was begun. This will have particular reference to the application of manures and cultural methods; hoe cultivation as at present practised results in the severance of much of the upper fibrous roots and part of the more woody ones, especially in the more open soils where the plate roots lie from three to ten inches below the surface.

CHEMICAL LABORATORY.

The designation of the officer in charge was changed to Government Chemist as the Director of Agriculture no longer holds the combined posts of Director and Government Chemist. An endeavour

was made to increase the utility of the laboratory to the Department by making agricultural chemistry the prime consideration in the work carried out. This change was in process of introduction when the Government Chemist proceeded on leave on September 8th during which he is taking a special course of study at Rothamsted Experimental Station to equip himself more fully for participation in the experimental and research work now being organized in connexion with the clove industry.

In May 1932 the Government Chemist attended the Conference of East African Soil Chemists held at the East African Agricultural Research Station, Amani.

The Laboratory Assistant carried out routine work during the absence on leave of the Government Chemist.

The following table gives the details of 945 samples received for examination during the year:—

Department	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Total 1932.	Total 1931.
Agriculture	245	145	342	66	798	1,510
Police	11	8	4	1	24	25
Health	27	22	20	15	84	100
Customs	10	7	3	—	20	14
Other Departments	6	11	1	—	18	3
Total Government	299	193	370	82	944	1,682
Private Samples	—	1	—	—	1	16
Total	299	194	370	82	945	1,698

The decrease as compared with 1931 is accounted for almost wholly by a reduction in the number of clove samples examined. During the 4th quarter only 66 clove samples were examined because on 18th October this more or less routine work was transferred to the Produce Inspection Branch to which it properly belongs. This transfer will also allow the Government Chemist more time for purely agricultural work in the laboratory.

Amongst the items of work carried out might be mentioned the testing of 18 samples of grape fruit and oranges for the "soluble solids/acid ratio" and juice percentages, by methods in use in South Africa. The local oranges gave a very high "Brix" reading and a low acid value compared with the imported varieties, but the latter were all within the South African standards; though the ratios were satisfactory the two factors comprising them tended to be on the low side, which explains a certain lack of flavour in the fruit. As this was only the second year of bearing of the imported varieties, no definite conclusions as to suitability can yet be drawn.

Moisture estimations were made in 97 samples of soil taken from experimental areas, and 69 samples of cloves, clove stems, clove oil and clove cigarettes, sent by the Zanzibar Protectorate Clove Mission to the Far East, were analysed and reported on.

A. J. FINDLAY,
Director of Agriculture.

APPENDIX.

Table I.

Protectorate clove crops for the past 35 seasons:—

Season.	Zanzibar	Pemba.	Total.
	Frs.	Frs.	Frs.
1897/98	48,000	157,000	205,000
1898/99	145,000	466,000	611,000
1899/1900	64,000	221,000	285,000
1900/01	37,000	200,000	237,000
1901/02	44,000	333,000	367,000
1902/03	172,000	252,000	424,000
1903/04	27,000	99,000	126,000
1904/05	81,000	654,000	735,000
1905/06	178,435	129,735	308,170
1906/07	63,004	203,496	266,500
1907/08	213,662	541,993	755,655
1908/09	165,727	449,691	615,418
1909/10	109,678	300,047	409,725
1910/11	52,100	139,307	191,407
1911/12	216,507	582,152	798,660
1912/13	31,018	104,368	135,386
1913/14	145,586	638,094	783,680
1914/15	194,920	331,389	526,309
1915/16	141,641	655,116	796,757
1916/17	208,716	302,919	511,635
1917/18	63,958	234,239	298,197
1918/19	259,273	565,229	824,502
1919/20	93,847	168,703	262,550
1920/21	231,831	316,446	548,277
1921/22	65,819	200,983	266,802
1922/23	291,417	690,498	981,915
1923/24	75,027	236,767	311,794
1924/25	240,952	520,490	761,442
1925/26	219,192	392,622	611,814
1926/27	203,843	529,186	733,029
1927/28	190,370	500,382	690,752
1928/29	74,828	125,740	200,568
1929/30	318,647	610,296	928,943
1930/31	51,796	201,320	253,116
1931/32	175,070	760,786	935,856
Average 35 Seasons	139,853	365,828	505,681

Table II.

Monthly Average Price of Cloves—Local.

Month.	1931. Zanzibar. Rs. per fras.	Pemba. Rs. per fras.	Stems. Rs. per fras.	Duty on Cloves. Rs. per fras.	1932. Zanzibar. Rs per fras.	Pemba. Rs. per fras.	Stems. Rs. per fras.	Duty on Cloves. Rs. per fras.
January	19.33	18.45	3.24	4.50	12.31	11.69	2.69	1.80
February	19.71	18.66	2.93	4.50	11.76	11.55	2.70	1.80
March	18.11	16.74	2.67	4.50	12.75	12.50	2.46	3.00
April	16.92	15.80	2.73	4.50	11.84	11.75	2.25	3.00
May	15.39	14.50	3.01	4.50	12.41	12.12	2.40	3.00
June	14.77	13.91	2.27	4.50	11.69	11.30	2.04	3.00
July	12.42	11.03	3.70	2.40	11.63	11.33	1.79	2.75
August	11.89	10.06	2.71	2.40	11.84	11.54	1.90	2.75
September	11.76	10.05	2.39	2.40	11.27	10.46	2.09	2.75
October	13.42	11.68	2.42	2.40	10.80	10.08	2.15	2.75
November	13.41	11.86	2.13	1.80	10.75	10.12	2.13	2.75
December	13.93	12.41	2.48	1.80	9.94	9.43	2.12	2.75
Yearly Average	15.09	13.76	2.72	3.35	11.58	11.16	2.23	2.67

All the above prices are "duty paid".
Prices for Stems are F.O.B.

Table III.

Monthly Average Price of Copra—Local.

Month.	1931. per frasila. Rs. Cts.	per ton. £. s. d.	1932. per frasila. Rs. Cts.	per ton. £. s. d.
January	2 11	10 2 7	2 17	10 8 5
February	2 18	10 9 3	2 62	12 11 7
March	2 22	10 13 1	2 43	11 13 2
April	2 23	10 14 1	2 13	10 4 4
May	1 94	9 6 3	2 06	9 17 2
June	1 53	7 6 10	1 90	9 2 5
July	1 83	8 15 8	1 97	9 9 2
August	1 63	7 16 5	2 10	10 1 7
September	1 49	7 3 0	2 12	10 3 7
October	1 80	8 12 9	2 13	10 4 4
November	1 94	9 6 3	2 08	9 19 7
December	2 04	9 15 10	2 12	10 3 7
Yearly Average	1 91	9 3 6	2 15	10 6 7

TABLE IV.

Meteorological Observations, 1932.

Month.	Temperature.				Rainfall.												
	Zanzibar Town.				Zanzibar.							Pemba.					
	Means of		Absolute														
	Max.	Min.	Max.	Min.	Town.	Selem.	Kidichi.	Koani.	Kinaoni.	Chwaka.	Chukwani.	Wete.	Wesha.	Mkoani.	Mtambili.	Fufuni.	Kigomacha.
January ...	87·2	80·6	91·5	77·8	1·58	3·37	2·98	1·07	2·93	0·59	2·08	2·39	3·32	1·94	5·90	6·45	1·70
February ...	86·5	79·9	88·5	73·2	4·07	3·03	4·09	3·70	4·52	5·71	6 63	1·67	4·23	0·63	2·69	0·97	...
March ...	87·1	79·6	92·0	75·1	8·87	8·14	9·71	11·90	14·19	3·37	6·46	4·32	7·67	2·33	7·84	7·66	1·23
April ...	85·1	78·1	90·4	75·2	15 89	11·45	14 12	18·51	16 68	18·01	15·34	9·44	10·64	10·97	13·04	10·72	13·26
May ...	83·1	76·2	85·5	73·0	9 93	13·74	11·03	12·84	10·12	17·68	7·13	26·50	20·41	20·49	25·82	22·25	23·52
June ...	82·6	75·2	84·2	72·8	3·41	1·61	2·80	2·86	2 32	1·70	1·6)	6·81	4·89	7·36	7·55	7·38	6·80
July ...	81·3	73·2	84·0	71·0	0·02	0·53	0 67	0·83	0 91	1·15	0·01	1·79	1·29	1·49	1·65	0·80	3·48
August ...	82·6	74·1	84·3	72·1	0·38	1 26	1·18	1·15	1·03	...	0·12	1·09	0·99	1·63	1·56	1·19	3·50
September ...	83·0	74·8	86·0	73·7	3 40	2 60	3·45	4·23	2·54	0·98	2·10	1·92	0·80	1·57	1·31	1·00	3·83
October ...	84·0	75·6	87·5	73·9	0·82	6·95	6·66	5·17	6·21	...	0·36	0·72	0·34	0·89	0·39	0·30	7·38
November ...	86·1	78·2	88·3	76·0	3·99	5·31	3·66	5·46	2·53	0·75	2·38	4·99	3·84	2·51	2·59	3·45	5 95
December ...	85·8	78·9	88·5	74·5	9·68	6 05	4·34	7·67	4·47	3·25	6·83	12·29	5·10	12·03	13·07	11·49	5·57
For the year ...	84·5	77·0	92·0	71·0	62·04	64·04	64·69	75·39	68·45	53·19	51·04	73·93	63·52	63·84	83·41	73·66	76·22